NON-PUBLIC?: N
ACCESSION #: 9211100138
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Oconee Nuclear Station, Unit 1 PAGE: 1 OF 7

DOCKET NUMBER: 05000269

TITLE: Reactor Trip Results From A Low Main Feedwater Pump Discharge Pressure Reactor Protective System Anticipatory Trip Signal Due To A Defective Procedure
EVENT DATE: 10/03/92 LER #: 92-15-00 REPORT DATE: 11/03/92

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 7.5

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(ii)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On October 3, 1992 at 0810 hours, Unit 1 tripped from 7.5 percent power on a Reactor Protective System Main Feedwater Pump (MFDWP) low discharge pressure anticipatory trip signal. The trip occurred during an attempt to restore the 1B MFDWP to service following minor maintenance. When the 1B MFDWP suction valve was opened it tied the unpressurized train to the operating 1A MFDWP train causing a momentary discharge pressure drop. This condition was the result of the controlling procedure's step to fill the pump casing not identifying the need to pressurize the system. This deficiency led the Operating team to determine this step not applicable, as the steps to drain the pump had not been performed. Immediately upon opening the suction valve, various Control Room alarms indicated that the Unit had tripped. The root cause for this event was defective procedure.

A contributing cause for this event was design deficiency. Immediate corrective action included safely controlling the reactor shutdown. Further corrective action will include procedure changes.

END OF ABSTRACT



BACKGROUND

A primary purpose of the Main Feedwater (FDW) System EIIS:SJ! is to supply FDW to the two Steam Generators (SG) EIIS:HX! at a temperature, pressure and flow rate, compatible with Reactor EIIS:VSL! power output, Main Steam EIIS:SB! demand, and SG demand. At Reactor power output levels of less than 60 percent, one of the two Main FDW Pumps is capable of performing this function.

The purpose of the Reactor Protective System (RPS) EIIS:JC! Anticipatory Trips is to generate a reactor trip prior to the initiation of a RPS reactor trip on high Reactor Coolant System (RCS) EIIS:AB! pressure in the event of a Main Turbine EIIS:TA! trip or a total loss of Main FDW. These trips limit the potential challenge to Power Operated Relief Valve due to overpressurization, which could occur during these two transients. The RPS trip logic for initiating a Reactor trip is based on a two-out-of-four channel (channels A-D) trip scheme and a predetermined trip setpoint. There are two anticipatory trips for loss of Main FDW: low FDW Pump Turbine control oil pressure and low Main FDW Pump discharge pressure. Associated pressure switches monitor and provide indication of the Main FDW Pumps discharge pressure to the RPS protective channels. The RPS trip setpoint for this trip is currently 800 psig. This trip setpoint was increased from 750 psig on July 7, 1991, as a corrective measure for a previous design deficiency. (Reference, Licensee Event Report 269/91-09).

EVENT DESCRIPTION

On October 1, 1992 at 0803 hours, Unit 1 was at 7.4 percent steady state power (holding for a minor modification: See LER 269/92-12) when the 1B Main Feedwater Pump (FDWP) was removed from service to perform corrective maintenance on the oil system. The 1A FDWP was supplying all of the Unit's feedwater requirements.

OP/1/A/1106/02, enclosure 3.12 (Isolation and Return To Service of FDWP and FDWP Turbine) was used to isolate the 1B FDWP train from the system. Progression of this procedure was stopped upon reaching step 2.5 which required the opening of 1FDW-284 (FDWP 'B' Vent Valve) to depressurize

the pump casing. This valve was found to be inoperable and in the closed position.

Reactor Operator A (RO A) notified the Control Room Senior Reactor operator (CRSRO) about the inoperable valve and discussed actions to be taken. The CRSRO had RO A to advise the Unit senior Reactor operator (USRO) of the situation and obtain guidance from him. The USRO contacted the Shift



Supervisor to analyze the situation for resolution. After reviewing the nature of the corrective maintenance to be performed and the procedure's guidance, it was determined that there was no need to depressurize and drain the isolated system. It was determined that the repair of the valve could wait until the next refueling outage, planned near the first of December 1992. The USRO informed RO A and CRSRO about the plan of action. They agreed with the plan.

As a result of determining that the 1B FDWP train would not need to be depressurized or drained and the assumption that the 1B FDWP casing would retain it's water inventory, steps 2.5 and 2.10 (fill the FDWP casing) of the procedure were marked not applicable (n/a). These n/a's were approved by the Shift Supervisor.

On October 3, 1992, the maintenance work was completed and operational control of the 1B FDWP was accepted by Operations.

At 0810 hours, step 2.13.2 (open the 1B FDWP suction valve, 1FDW-6) was initiated from the control room by RO A. At this same time, the 1A FDWP discharge pressure decreased slightly below the setpoint of 800 psig which initiated the associated Reactor Protective System's trip signal for an anticipatory reactor trip.

At 0810 hours, both 1A and 1B Motor Driven Emergency Feedwater Pumps (MDEFDWP) started.

The Turbine Driven Emergency Feedwater Pump also received a start signal at 0810 hours, but did not complete the start, because the condition for the start was not satisfied for the designed minimum fifteen second time delay. At this same time, all full length rods fully inserted into the core and the reactor was shutdown.

Both MDEFDWPS were secured two minutes and thirty-one seconds later, after it was determined that the 1A FDWP had not tripped.

Post trip response was as expected. Pressurizer level decreased from about 225 inches prior to the trip to a minimum of 176 inches two minutes after the trip. The level then increased slowly before reaching a maximum of 240 inches ten to thirteen minutes after the trip. Reactor Coolant System (RCS) pressure decreased from 2133 psig prior to the trip to a minimum of 2055 psig approximately one minute post trip. RCS pressure then peaked at 2203 psig, before slowly stabilizing. Hot and cold RCS temperatures converged to an average of 560 degrees F thirty seconds post trip and decreased steadily to a minimum average of approximately 550 degrees F



three minutes after the trip. RCS total flow remained essentially constant throughout the transient. Steam Generator (SG) A and B levels increased from 24 inches prior to the trip to 36 and 34 inches respectively two to three minutes after the trip and then stabilized at 25 inches eleven minutes post trip. SG A and B pressures increased from 892 and 893 psig to 1009 and 1010 psig respectively, before stabilizing at 990 psig thirteen minutes after the trip.

Immediate corrective action was to stabilize the plant in a safe shutdown condition.

## CONCLUSIONS

The root cause of this event is defective procedure. One contributing cause, design deficiency, was also identified for this event. The low pressure transient occurred when the 1B Main Feedwater Pump (FDWP) suction valve (1FDW-6) was opened on a partially filled, depressurized system. This resulted in diverting a portion of the Condensate Booster Pump's EIIS:SD! output away from the operating 1A FDWP, causing a low discharge pressure on that FDWP and satisfying the Reactor Protective System logic for an anticipatory reactor trip.

The root cause for this event, defective procedure, did not contain a step to accomplish pressurization of the out of service pump. Procedure step 2.10, which is performed prior to the step (2.13.2) requiring the suction valve (1FDW-6) to be opened, clearly states to open 1FDW-284 and 1FDW-7 to fill the pump casing. The step has the user to; 1) open and Close 1FDW-7 and 2) open 1FDW-284 to fill the pump casing with water. This step was not written with the intent of pressurizing the pump and there is nothing in it to imply that it could have been for this intent. After discovering that the 1B FDWP vent valve was inoperable and that the 1B FDWP train did not need to be depressurized or drained, an evaluation of the procedure steps which required the operation of that valve was

performed. During the evaluation of the procedure steps the Operating team keyed on the wording in step 2.10 and determined that it could be marked not applicable. The evaluation assumed that the pump casing would remain filled, but did not consider system pressure because of the deficient procedure wording. The Operations team involved in this evaluation included two Reactor Operators and three Senior Reactor Operators. Also, five of six other licensed operators, who were not involved in this event, stated that they would have probably agreed with the reasoning of the evaluation at the time it was made. This implies that the procedure does not adequately express the need to pressurize the isolated train.



A design deficiency in the Reactor Protective System's (RPs) anticipatory reactor trip logic for FDWP low discharge pressure is considered a contributing cause for this event. The current RPS trip logic may be too conservative, thus making it unnecessarily sensitive to normal plant evolutions which cause minor and momentary perturbations in the Feedwater System. This reactor trip was technically unnecessary, because the 1A FDWP did not trip off-line and continued to supply the Unit's feedwater needs. Data analyzed from the Utility Typer revealed that the total time endurance, from the first FDWP low discharge pressure alarm to the final RPS signal (on Channel C), that tripped the reactor, was one second. Immediately following this time frame, the FDWP regained it's nominal discharge pressure and continued to supply feedwater flow at the necessary pressure. The potentially excessive conservatism of the RPS trip logic is embodied in the following two deficiencies: 1) Present design allows a reactor scram without regard to time endurance of the initiating parameter. 2) The current setpoint for RPS tripping the reactor on FDWP low discharge pressure is 800 psig, where the original design setpoint for this function was 750 psig. This change in setpoint occurred on July 7, 1991 and applied to all three Units. This change was initiated to compensate for a design deficiency which did not consider the pressure added to the Feedwater System by the Feedwater Heater 'D' Drain Pump which removed one of the required diverse actuation system for the initiation of the Emergency Feedwater Pumps. As a result of these deficiencies, including this event, there have been three reactor trips initiated by RPs on low FDWP discharge pressure where the FDWPs did not actually trip off-line. All of these events occurred within the past eleven months. Prior to the setpoint change (back to 1984) no event could be found where the reactor tripped due to a spurious low FDWP discharge pressure oscillation. This condition has a negative impact on plant reliability and unnecessarily challenges safety systems.

Based on a two year review of past events, this event has been determined

to be recurring. Two previous Licensee Event Reports (LER) were found that described a spurious type event and included some of the same causal factors. LER 287/91-02 described a Unit 3 event, which occurred on November 23, 1991, where Feedwater oscillations resulted in an anticipatory reactor trip initiated on a low FDWP discharge pressure RPS signal. This report classifies the root cause for this event as equipment failure due to an unanticipated interaction control signal by the Integrated Control System. LER 269/92-04 described a Unit 1 event, which occurred on May 8, 1992, where a momentary drop in the FDWP's discharge pressure caused RPS to initiate an anticipatory reactor trip due to low FDWP discharge pressure. This report classifies the root causes of this event as a management deficiency (inadequate training and no task specific procedures). A comparison and analysis of these events indicated that; 1) t
e previous two



events are similar to this event in that each was an anticipatory reactor trip initiated by the RPS low FDWP discharge pressure signal, 2) all three of the trips have occurred after (July 7, 1991) the low FDWP discharge pressure trip setpoint was increased to 800 psig, 3) the FDWPs did not trip off-line and continued to supply adequate feedwater flow to the Steam Generators in all of the events, and 4) in each event the dips in the FDWP discharge pressure were only momentary. A review of reactor trips back to 1984 revealed that no trips occurred as a result of spurious FDWP low discharge pressure prior to the setpoint change in 1991.

There was no equipment failure associated with this event that would require reporting to NPRDS. This event did not involve any personnel injuries, radiation overexposures, or release of radioactive material.

CORRECTIVE ACTIONS

Immediate

Operator action controlled the reactor to a safe shutdown condition.

Subsequent

None

Planned

1) Revise Enclosure 3.12 of procedure OP/1/A/1106/02 to pressurize

the isolated Feedwater Pump train prior to opening the suction valve.

2) Provide training to all licensed personnel concerning this event.

3) Evaluate the Reactor Protective System's anticipatory trip logic for low Feedwater Pump Discharge Pressure. This evaluation should determine if it would be appropriate to alter the logic to allow more time prior to initiating the reactor trip to ensure that there is a high probability that the Feedwater Pumps have tripped off line.



SAFETY ANALYSIS

The reactor tripped on an anticipatory trip signal from the Reactor Protection System (RPS). This signal was generated as a result of a momentary dip in the 1A Main Feedwater Pump (FDWP) discharge pressure. The FDWP did not actually trip off line. The 1B FDWP was isolated at this time for corrective maintenance.

All accident mitigation systems and their support systems were available and performed as designed. Both Motor Driven Emergency Feedwater Pumps (MDEFDWP) actuated and performed as designed to remove residual heat. The Turbine Driven Emergency Feedwater Pump received a start signal, but was not required to start and did not. Both MDEFDWPs were occurred approximately two minutes and thirty seconds after they started, because the 1A FDWP did not trip and supplied the necessary water flow and pressure to maintain necessary Steam Generator levels.

All full length control rods dropped completely into the core and the reactor was shutdown and maintained in a safe shutdown condition.

The pressurizer safety valves and the power operated relief valve were not actuated. There was no Engineered Safety Feature Actuation System initiation. There was no lose of Reactor Coolant System (RCS) water inventory.

Plant post trip response was normal for the level of reactor power level. This includes Pressurizer level, RCS pressure, temperature, and flow, and Steam Generator levels and pressures. Control room personnel actions safely controlled the reactor and maintained it in a safe shutdown condition.

The RPS anticipatory reactor trips are a conservative non-nuclear trip function used to generate a reactor trip prior to the actuation of the RPS nuclear trips. These trips limit the extent of overheating of the RCS which could occur during a turbine trip or a total loss of main feedwater.

This event did not compromise the health and safety of the public.

ATTACHMENT 1 TO 9211100138 PAGE 1 OF 1

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DUKEPOWER

November 3, 1992

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: Oconee Nuclear Site
Docket Nos. 50-269, -270, -287
LER 269/92-15

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/92-15, concerning a reactor trip.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(ii). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

J. W. Hampton
Vice President

/ftr

Attachment

xc: Mr. S. D. Ebneter INPO Records Center

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